Find $\frac{dy}{dx}$ algebraically. Check your answer with your calc.

(a) $y = (3x^2 - x)^3$

(b) $y = x\sqrt{1-x^2}$

(c) $y = x\sin^2(\pi x - 2)$

(d) $y = \sqrt{\frac{2x}{x^2+2}}$

KO 10/28/09

① $y = (3x^2 - x)^3$

$nu^{n-1} \cdot \frac{du}{dx}$

$y' = 3(3x^2 - x)^2 (6x - 1)$

② $y = x\sqrt{1-x^2}$

$y = x(1-x^2)^{\frac{1}{2}}$

$y' = x\left(\frac{1}{2}(1-x^2)^{-\frac{1}{2}} \cdot -2x\right) + \sqrt{1-x^2} \cdot 1$

$y' = x\left(\frac{-2x}{2\sqrt{1-x^2}}\right) + \sqrt{1-x^2}$

$y' = \frac{-x^2 + (1-x^2)}{\sqrt{1-x^2}} = \frac{-2x^2+1}{\sqrt{1-x^2}}$

(3) $y = x\sin^2(\pi x - 2)$

$y' = x\left[2\sin(\pi x-2)\cos(\pi x-2)\cdot\pi\right] + \sin^2(\pi x-2)\cdot 1$

$y' = 2\pi x\sin(\pi x-2)\cos(\pi x-2) + \sin^2(\pi x-2)$

$y' = \sin(\pi x-2)\left[2\pi x\cos(\pi x-2) + \sin(\pi x-2)\right]$

(4) $y = \sqrt{\frac{2x}{x^2+2}}$

$y = \left(\frac{2x}{x^2+2}\right)^{\frac{1}{2}}$

$y' = \frac{1}{2}\left(\frac{2x}{x^2+2}\right)^{-\frac{1}{2}}\left[\frac{(x^2+2)(2) - 2x(2x)}{(x^2+2)^2}\right]$

$y' = \frac{\frac{1}{2}(x^2+2)^{\frac{1}{2}}}{\sqrt{2x}}\cdot\left[\frac{(-2x^2+2)}{(x^2+2)^2}\right]$

$y' = \frac{-x^2+2}{\sqrt{(x^2+2)^3}\sqrt{2x}}$

$y = (3x^2 - x)^3$

$nu^{n-1} \cdot \frac{du}{dx}$

$y' = 3(3x^2 - x)^2 (6x - 1)$

$y = x\sqrt{1-x^2}$

$y = x(1-x^2)^{\frac{1}{2}}$

$y' = x\left(\frac{1}{2}(1-x^2)^{-\frac{1}{2}} \cdot -2x\right) + \sqrt{1-x^2} \cdot 1$

$\frac{-x^2}{\sqrt{1-x^2}} + \frac{\sqrt{1-x^2}}{1} \cdot \frac{\sqrt{1-x^2}}{\sqrt{1-x^2}}$

$y' = x\left(\frac{-2x}{2\sqrt{1-x^2}}\right) + \sqrt{1-x^2}$

$\frac{-x^2 + (1-x^2)}{\sqrt{1-x^2}}$

$y' = \frac{-x^2 + (1-x^2)}{\sqrt{1-x^2}} = \frac{-2x^2 + 1}{\sqrt{1-x^2}}$

$\pi x - 2)$

$$y' = \frac{-x^2 + (1-x^2)}{\sqrt{1-x^2}} = \boxed{\frac{-2x^2+1}{\sqrt{1-x^2}}}$$

(3) $y = x\sin^2(\pi x - 2)$

$y = x\left(\sin(\pi x - 2)\right)^2$

$y' = x\left[2\sin(\pi x-2)\cos(\pi x-2)\cdot\pi\right] + \sin^2(\pi x-2)\cdot 1$

$x \cdot 2\sin(\pi x-2)\cos(\pi x-2)\cdot\pi$

$\sin 2x = 2\sin x\cos x$

$y' = 2\pi x\sin(\pi x-2)\cos(\pi x-2) + \sin^2(\pi x-2)$

$y' = \pi x \sin 2(\pi x-2) + \sin^2(\pi x-2)$

$y' = \sin(\pi x-2)\left[2\pi x\cos(\pi x-2) + \sin(\pi x-2)\right]$

(4) $y = \sqrt{\frac{2x}{x^2+2}}$

$y = \left(\frac{2x}{x^2+2}\right)^{\frac{1}{2}}$

$y' = \frac{1}{2}\left(\frac{2x}{x^2+2}\right)^{-\frac{1}{2}}\left[\frac{(x^2+2)(2) - 2x(2x)}{(x^2+2)^2}\right]$

$y' = \frac{1}{2}\frac{(x^2+2)^{\frac{1}{2}}}{\sqrt{2x}} \cdot \left[\frac{(-2x^2+2)}{(x^2+2)^2}\right]$

$y' = \frac{-x^2+2}{}$

$$y' = 2\pi x \sin(\pi x - 2)\cos(\pi x - 2) + \sin^2(\pi x - 2)$$

$$y' = \sin(\pi x - 2)\left[2\pi x \cos(\pi x - 2) + \sin(\pi x - 2)\right]$$

(4) $y = \sqrt{\dfrac{2x}{x^2+2}}$

$y = \left(\dfrac{2x}{x^2+2}\right)^{\frac{1}{2}}$

$$y' = \frac{1}{2}\left(\frac{2x}{x^2+2}\right)^{-\frac{1}{2}}\left[\frac{(x^2+2)(2) - 2x(2x)}{(x^2+2)^2}\right]$$

$2x^2+4 \quad -4x^2 \quad = -2x^2+4$

$= 2(-x^2+2)$

$$y' = \frac{1}{2}\frac{(x^2+2)^{\frac{1}{2}}}{\sqrt{2x}} \cdot \left[\frac{2(-x^2+2)}{(x^2+2)^2}\right] = \frac{(x^2+2)^{\frac{1}{2}}(-x^2+2)}{\sqrt{2x}\,(x^2+2)^2}$$

$$y' = \frac{-x^2+2}{\sqrt{(x^2+2)^3}\sqrt{2x}}$$

$\dfrac{x^3}{x^5} = \dfrac{1}{x^2}$

$\dfrac{1}{x^2} = x^{-2}$

$-\frac{3}{2}$

$\frac{1}{2}$

(19)

$$y = \frac{3}{\sqrt{2x+1}}$$

$$y = 3(2x+1)^{-\frac{1}{2}}$$

$$y' = -\frac{3}{2}(2x+1)^{-3/2} \cdot 2$$

$$y' = -3(2x+1)^{-3/2}$$

$$y' = \frac{-3}{(2x+1)^{3/2}}$$

(#36) $(f \circ g)(x) = \pi x + \sec^2(\pi x)$

$$= \pi x + \frac{1}{\cos^2(\pi x)}$$

$$(\sec(\pi x))^2$$

deriv. $= \pi + 2\sec(\pi x)\sec(\pi x)\tan(\pi x) \cdot \pi$

$$= \pi + 2\sec^2(\pi x)\tan(\pi x) \cdot \pi$$

at $x = \frac{1}{4}$

$$= \pi + 2\sec^2\left(\frac{\pi}{4}\right)\tan\left(\frac{\pi}{4}\right) \cdot \pi$$

$$= \pi + 2(\sqrt{2})^2 \cdot 1\pi$$

$$= \pi + 4\pi$$

$$= 5\pi$$

Work on this now

for HW do enough

0 - Don't get it

1 - feel like I get it but keep getting the wrong answer

2 - I'll get a C or B on the test

3 - A+ All star